

REMARKS

In view of the foregoing amendments and following remarks responsive to the Office Action of March 24, 2004, Applicant respectfully requests favorable reconsideration of this Application.

Prior Art Rejections

The Office rejected claims 1, 2 and 5 under 35 U.S.C. § 102(e) as being anticipated by Murphy et al. (U.S. Patent No. 5,567,520). The Office further rejected claims 27–32, 34, and 35 under 35 U.S.C. §102(a) as being anticipated by Applicant's admitted prior art. The Office rejected the remaining claims under 35 U.S.C. §103(a), as follows:

- claims 4 and 18 — unpatentable over Murphy et al;
- claims 6 and 7 — unpatentable over Murphy et al. in view of Scott et al. (U.S. Patent No. 6,160,885);
- claim 8 — unpatentable over Murphy et al. in view of Scott et al. and Yong et al. (U.S. Patent No. 5,255,094);
- claims 9 and 10 — unpatentable over Murphy et al. in view of the admitted prior art;
- claims 11 and 12 — unpatentable over Murphy et al. in view of the admitted prior art and Scott et al.
- claim 13 — unpatentable over Murphy et al. in view of the admitted prior art and Yong.

- claims 14–17 — unpatentable over Murphy et al. in view of the admitted prior art, Scott et al., and Yong;
- claims 19-26 — unpatentable over the admitted prior art in view of Scott and Jamshidi; and
- claim 33 — unpatentable over the admitted prior art in view of Scott

Applicant respectfully traverses the prior art rejections.

The Present Invention

The many pieces of equipment that use the telephone lines for communication include circuitry for determining whether the telephone line to which it is coupled is off-hook prior to attempting to use that line. It is necessary because it is often the case that another piece of equipment may already be using the same line. In the past, dedicated circuitry for determining an off-hook condition of the line has been incorporated into such equipment.

In the past, telecommunication equipment manufacturers have utilized voltage comparator circuits to detect the DC voltage across the tip and ring of the subscriber loop and then used the comparator output as an on-hook/off-hook indicator signal.

The present invention provides a low-cost simple circuit that utilizes a low power analog-to-digital converter that already is incorporated into the telecommunication device and used for other functions, such as caller ID and ring detection, thus reducing the amount of hardware that is added for the sole purpose of detecting on-hook/off-hook status. In one embodiment of the invention, the only additional dedicated circuitry necessary to implement the invention is a voltage divider coupled to tip and ring and a

transistor having its control input coupled to the common node of the voltage divider, one of its current flow terminals coupled to the analog input of the analog-to-digital converter, and the other current flow terminal coupled to ground. The resistors of the voltage divider are proportioned so that the common node voltage of the divider is above the threshold voltage of the transistor when the voltage request tip and ring is at the on-hook voltage (approximately 48 volts in the United States), thus turning the transistor on; and is below the transistor threshold voltage when the voltage across tip and ring is at the off-hook voltage (approximately 20 volts in the United States), thus turning the transistor off. With this scheme, when the transistor is on, the A/D converter input is driven to ground, thus keeping the voltage at the common node of the voltage divider from having any effect. When the transistor is off, however, the A/D converter input is driven to the common node voltage of the transistor. Accordingly, when the transistor is off, the digital output of the A/D converter is an indication of the voltage on the telephone line and thus whether it is on-hook or off-hook. The output of the A/D converter can be coupled to a digital signal processor that disables the device from going off-hook if the A/D converter detects that the loop is already off-hook.

In an alternate embodiment, the voltage across one of the resistors of the voltage divider is provided to the A/D converter through the current flow terminals of one or more transistors so that the A/D converter receives a scaled version of the tip to ring voltage (rather than merely a two-state on-hook/off-hook signal, as in the first embodiment). The DSP may use the specific line voltage information provided in this particular embodiment to determine additional information about the loop.

The Admitted Prior Art

The admitted prior art is shown in Figure 1 and comprises a voltage divider coupled between tip and ring with the common node of the voltage divider coupled to a first input of a comparator. The second input of the comparator is coupled to a reference voltage somewhere between the typical on-hook voltage and the typical off-hook voltage. The output comparator is fed through an optical coupler to the DSP, which uses the output comparator as an indicator of whether the line is on-hook or off-hook. The optical coupler is necessary because a less expensive electrical coupling circuit, whether inductive or capacitive, would not function well in this application because the signal across tip and ring can change too slowly to be distinguished from noise by an electrical coupling circuit.

Murphy et al.

Murphy et al. describes a method and apparatus for the detection of one or more telephone off-hook conditions using an analog-to-digital converter (ADC) to detect voltage changes between the tip and ring lines of a telephone network loop. Murphy employs an isolation network (consisting of four resistors and four diodes) (Figure 3) to provide electrical isolation from voltage surges on the tip and ring lines of the POTS network. A differential amplifier is used to scale the tip and ring voltage to a suitable range for the ADC. The ADC outputs a digital voltage to a decision-making element, such as a microprocessor or digital signal processor. The processor then detects when one or more of the multiple POTS devices coupled to the network wiring loop go into an off-hook state.

Scott et al.

Scott et al. describes a telephone system including a diode bridge, line side circuits that are isolated from external power sources by capacitive isolation barriers, and user-powered circuits (for example, ringer timing circuits). The line side circuits include hookswitch, caller ID, and ringer interface circuits. When caller ID information is present, a multiplexer transmits the caller ID data to an analog-to-digital converter for conversion of the caller ID data to digital signals. During off-hook operations, the multiplexer transmits the off-hook data from the integrated hookswitch circuits to the analog-to-digital converter. The digital signals (i.e., caller ID data and off-hook data) are then transmitted across the capacitive isolation barriers.

Response to Rejections

The Office rejected independent claim 1 and dependent claims 2 and 5 under 35 U.S.C. sec. 102(e) as anticipated by Murphy et al. Claim 1 recites, inter alia, “a voltage divider for coupling between said tip and ring lines and having a node at which is presented a scaled version of a voltage across said voltage divider.” The Office asserts that Murphy et al. anticipates claim 1 because Murphy et al. allegedly discloses such a voltage divider in Figure 3 (elements Ri, R1 and R2).

The Applicant respectfully disagrees. Figure 3 of Murphy et al. depicts two voltage dividers – a first voltage divider formed by Ri and R1 coupled between Tip/Ring and the local system ground, and a second voltage divider formed by Ri and R2 coupled between Ring/Tip and the local system ground. Neither of these voltage

dividers satisfies the claimed limitation “a voltage divider for coupling between said tip and ring lines.”

It must be noted here that the POTS System (or Plain Old Telephone System) conventionally connects to Customer Premises Equipment (CPE) via only a single twisted pair. On the two wires in the twisted pair, the POTS Central Office provides a differential telephone signal, containing both AC components (e.g., the voice or data content, plus any AC noise that may appear on the line) and a DC component (e.g., to provide power to local CPE devices and to indicate an on/off-hook condition on the line). Notably, the POTS system does not provide a ground wire between the POTS Central Office and the local CPE. Rather, the two-wire system is a “floating” system at the customer side. In this system, over the potentially long distance between the Central Office and the Customer Premises, atmospheric effects and other types of electromagnetic interference can affect the voltage on the two wires. Because both of the wires in the twisted pair are subject to the same environmental conditions or electromagnetic interference, both develop substantially the same voltage, known as the “common-mode voltage.” The common-mode voltage in the POTS system can rise to surprisingly high levels, e.g., on the order of 1500 volts or more with respect to the ground of the local power system at the Customer Premises.

Murphy et al. attempts to solve this problem of potentially destructive common-mode voltages by providing an isolation network 20 in Figure 3 comprising two input resistors R_i having extremely high resistances (40 mega-ohms or greater) placed in series with each of the tip and ring lines. After the two input resistors R_i , Murphy et al. provides ground connection resistors R_1 and R_2 , connected to ground. Importantly, to

one of skill in the art, it is plain from Figure 3 that the ground to which resistors R1 and R2 are connected is the ground provided by the local power system at the customer premises.

Two serious disadvantages result from the technique used in Murphy et al. First, the input resistors R_i hugely attenuate the signal on the tip and ring lines. In Murphy et al, the attenuated signal must therefore then be amplified by a high-gain differential amplifier, which is expensive and may introduce distortion to the amplified signal.

Second, and perhaps more importantly, there is the problem of mismatch in input resistances R_i and ground connection resistors R1 and R2. All real resistors have values that are nominally a specified resistance value but that actually may only be close to the specified resistance value, due to variations in the resistor manufacturing process. For example, a resistor that is nominally 40 mega-ohms may actually be somewhere in the range from, e.g., 39 megaohms to 41 megaohms. Thus, in this example, the first input resistor R_i could be 39 megaohms, while the second input resistor R_i could be 41 mega-ohms. Thus, although resistors R_i , R1 and R2 are specified to be a particular resistance value, they actually end up having different values, or being “mismatched.”

The mismatch problem is compounded in Murphy et al., because the resistances are extremely large and the resistance variations may accordingly also be extremely large. The problem is further compounded in Murphy et al. because the voltage dividers in Murphy et al, formed by resistors R_i and R1 and by R_i and R2, are connected to the local CPE ground. As a result, the potential mismatch between the first R_i and the

second R_i , and between R_1 and R_2 , results in voltage errors (known as “common-mode errors”) in the voltages that are ultimately input to the analog-to-digital converter.

The present invention avoids these issues of extreme attenuation, distortion, and mismatch by (1) locating the isolation barrier *after* the analog-to-digital converter, thus avoiding the problems of attenuation and distortion that may be introduced by the differential amplifier of Murphy et al., and (2) providing a voltage divider that is connected *between* the tip and ring lines, rather than between tip and the CPE ground, and between ring and the CPE ground, as in Murphy et al. Because the voltage divider in the present invention does not serve as an isolation barrier, the resistors are not required to be as huge as those in Murphy et al., both physically and in terms of resistance value, and may thus be manufactured with a much higher precision, and much lower cost, than those in Murphy et al. Further, the voltage divider of the present invention provides a scaled voltage that is referenced solely to the tip and ring lines, rather than to a local CPE ground, and thus entirely avoids the potentially large voltages that tend to create common-mode errors in Murphy et al.

From the above discussion, it is clear that Murphy et al. does not anticipate the present invention, because Murphy et al. does not disclose “a voltage divider for coupling *between said tip and ring lines* and having a node at which is presented a scaled version of a voltage across said voltage divider; a transistor having a control terminal coupled to said node and a first current flow terminal coupled to a voltage source and a second current flow terminal; and an analog-to-digital converter having an analog input and a digital output, said analog input coupled to said second current flow terminal of said transistor.”

Dependent claim 2 even further distinguishes over Murphy et al. Claim 2 recites: “The circuit of claim 1 wherein: said voltage divider comprises a first resistor having a first terminal for coupling to said tip line and a second terminal coupled to said node and a second resistor having a first terminal for coupling to said ring line and a second terminal coupled to said node.” As discussed above, resistors R1 and R2 in Murphy et al. are connected to the local CPE ground, rather than to tip or ring. Thus, claim 2 even further distinguishes over Murphy et al.

Claim 5 depends from claims 1 and 2 and, therefore, is not anticipated by Murphy et al. for the same reasons as claims 1 and 2, discussed above.

The Office rejected claim 4 under 35 U.S.C. sec. 103(a) as unpatentable over Murphy. Claim 4 recites: “The circuit of claim 2 wherein said voltage of said voltage source is ground.” The Office asserts that it would have been obvious at the time of the invention to reference the differential amplifier between ground and another value for the purpose of providing a current sink that is resilient to power fluctuations. The Applicant submits that the Office has failed to establish a prima facie case of obviousness, because the purpose asserted by the Office to justify the combination fails to explain why or how connecting an amplifier to ground renders the amplifier “resilient to power fluctuations.” The Office has thus failed to provide a motivation to make the proposed combination. Additionally, the Applicant submits that claim 4 is allowable for the same reason as claims 1 and 2, discussed above.

The Office rejected claims 6 and 7 under 35 U.S.C. sec. 103(a) as unpatentable over Murphy et al. in view of Scott et al. (U.S. Patent No. 6,160,885). Claim 6 presently recites: “The circuit of claim 2 wherein said analog to digital converter is a differential

converter comprising first and second analog input terminals, said first analog input terminal coupled to said tip line and said second analog input terminal coupled to ring." Claim 7 further recites: "The circuit of claim 6 further comprising a first capacitor coupled between said tip line and said first analog input terminal of said analog-to-digital converter and a second capacitor coupled between said ring line and said second analog input terminal of said analog to digital converter."

The Office asserts that Murphy et al. discloses each limitation of claim 6 and 7 except coupling the analog-to-digital converter to tip and ring (and, in the case of claim 7, using capacitors to do so). The Office further asserts that Scott et al. teaches multiplexing an analog-to-digital converter between hook-state detection and caller-id detection. (3/24/04 OA at 6-7). The Office asserts that it would have been obvious to combine Murphy et al. with Scott et al. for the purpose of reducing parts needed for hook-state and caller ID circuits. The Applicant respectfully disagrees.

As an initial matter, as discussed above, Murphy et al. fails to disclose the limitation set forth in claim 1, that the voltage divider is coupled between the tip and ring lines. Thus, the asserted combination still fails to disclose or suggest all of the elements of claim 6. Furthermore, the Applicant submits that the Examiner is using hindsight to read into the teaching of Scott et al. that which only the Applicant has taught – namely, the use of the analog-to-digital converter, already in place for the purpose of such features as caller ID, to also detect the on/off-hook condition in addition to those other features, in a useful and cost effective way.

More specifically, the Applicant controverts the Examiner's assertion that "Scott teaches that an analog-to-digital converter used for hook-state detection can be

multiplexed." In fact, Scott et al. teaches merely that "[i]n other cases when caller ID information is not present (such as in an off-hook situation), the mux 1812 may provide data from the integrated hookswitch circuits to the ADC 1814 for conversion to digital data which may then be transmitted across the isolation barrier." (Scott et al., col. 23, ll. 53-56.) It is entirely unclear from the teaching of Scott et al. what the "data from the integrated hookswitch circuits" actually is, nor does Scott et al. suggest that the integrated hookswitch circuits provide a loop-condition determination as in the present invention. Thus, the Applicant submits that the Office goes beyond the teaching of Scott et al. in concluding that the data from the integrated hookswitch circuits is, in fact, the on/off-hook condition determination of the present invention.

In addition, the present invention contemplates that the analog-to-digital converter may *simultaneously* receive, and convert, the AC signal part of the tip/ring line signal and the DC on/off-hook signal part of the tip/ring line signal. In accordance with the invention, the substantially DC portion is split from tip and ring, passed through bridge BR1 in Figures 2 and 4 of the application, and then separately scaled by the voltage divider before being passed to the analog-to-digital converter. The present invention further provides that *both parts* of the signal (the AC part, via capacitors C1 and C2, and the substantially DC part, via bridge BR1, voltage divider, and transistor switches Q1 and Q2/Q3) are input into the analog-to-digital converter, *simultaneously*. The present invention makes this simultaneous input feasible by separately scaling the AC signal part and the substantially DC signal part to ranges that are suitable for the analog-to-digital converter. Applicant submits that the claimed circuitry, including the voltage divider for the DC part and the analog tip/ring input to the ADC for the AC part

are unique and non-obvious, even in view of the simple control-signal driven multiplexer of Scott et al. The simultaneous capability of the present invention is neither provided nor suggested by Murphy et al. or Scott et al., and results from the unique circuit geometry that is claimed in claims 6 and 7. Thus, claims 6 and 7 are allowable over Murphy et al. and Scott et al.

The Applicant submits that claim 8 is allowable over Murphy in view of Scott et al. and further in view of Yong, for the same reasons as discussed above in connection with claim 7, from which it depends. Moreover, Yong et al. may not be applied as prior art because it is not in the same field of endeavor as the present invention (i.e., telecommunication loop condition determination) nor is it pertinent to the problem to be solved. In the present invention, the problem to be solved is enabling and disabling a transistor for the purpose of connecting a DC signal indicative of an on/off-hook condition to, and disconnecting the DC signal from, an analog-to-digital converter. In contrast, Yong et al. "concerns an audio signal processing system in a television receiver or the like arranged to suppress the audible effects of transients produced when the system is energized or de-energized." Yong et al., col. 1, ll. 7-10. Yong et al. is thus not relevant prior art to the present invention and cannot support a rejection under 35 U.S.C. §103(a).

Claims 9–15 are allowable for the same reasons that claims 1–8, from which they depend, are allowable, as discussed above.

Claim 16 is allowable over Murphy et al. in view of the Applicant's admitted prior art in view of Scott and further in view of Yong. Claim 16 recites the apparatus of claim 15, further comprising a full wave rectifier circuit coupled between said detection circuit

and said tip and ring lines. The Office asserts that Murphy in view of Scott makes obvious all of the limitations of claim 16 except the limitation of a full-wave rectifier circuit. The Office further asserts that it would have been obvious to use a full-wave bridge rectifier in the manner of the present invention for the purpose of "forcing one of the tip and ring lines to always be of a greater absolute value, therefore eliminating the need of the complicated detection algorithm necessitated by Murphy."

Applicant submits that claim 16 is novel and non-obvious for all of the reasons specified above in connection with claims 1–15, none of which are cured by the additional citation of Applicant's admitted prior art. Moreover, the Applicant submits that the purpose stated by the Office for supporting the asserted combination, to avoid the complicated detection algorithm of Murphy et al., nonetheless fails to provide sufficient, or indeed any, motivation to make the proposed combination. Applicant submits that the "complicated" detection algorithm of Murphy et al. (i.e., using the absolute value of the signal) involves the simple step of instructing the processor to ignore or drop the sign bit of the digitally-converted input voltage level. Thus, the asserted motivation, in fact, would not tend to motivate a person of ordinary skill to make the asserted combination. Moreover, the addition of a bridge rectifier, as in the claimed invention, entails a substantial increase in the cost of the final product. One would thus be led away from the proposed combination. In contrast, in the present invention, the addition of the bridge rectifier furthers the implementation of the invention by rectifying the signal on the tip and ring lines, thus extracting the DC portion of the tip/ring signal, prior to scaling the DC portion via the voltage divider and level shifting it via the claimed transistor. Claim 16 is thus allowable over the cited art as applied by the Office.

Claims 17 and 18 are allowable for the same reasons discussed above in connection with claims 1–16.

Claim 19 is allowable over the cited prior art. The Office asserts that claim 19 is obvious in view of the admitted prior art in view of Scott et al and further in view of Jamshidi (U.S. Patent No. 5,646,558), because, inter alia, "the prior art discloses an analog-to-digital converter comprising a comparator (i.e., differential) and optical coupler. (3/24/04 OA at 13.) The Office asserts that the comparator of the admitted prior art is an analog-to-digital converter because it has an analog input from the voltage divider and provides a digital output that is a single-bit representation of the analog input. (3/24/04 OA, p. 17).

The Applicant has already provided a detailed response to this position on the part of the Office, which was first presented in the Office Action of October 24, 2003. With respect to the issue of the meaning of "analog-to-digital converter," Applicant explained that the claim limitation "analog-to-digital converter" is well-defined in the art and does not comprise a comparator. (1/23/04 Response, p. 18-19). Applicant submits that one of ordinary skill in the art would not ordinarily understand the term "ADC" as encompassing a one-bit comparator. The present specification also supports this ordinary meaning. In particular, the ADC described in the present specification must be capable of being "used for other functions such as caller ID and ring detection." (Specification, p. 5, ll. 13-14). The claimed ADC must therefore have more than a bistable output (i.e., a one-bit resolution). Rather, it must have a sufficient resolution to perform those secondary functions (e.g., at least a three-bit resolution). Such a resolution, or greater, is provided in analog-to-digital converters currently used for these

functions. To avoid any possible ambiguity that may exist in the term, "analog-to-digital converter," however, Applicant has clarified the plain meaning of the limitation "analog-to-digital converter" in the present amendment by specifying that the analog-to-digital converter of the present invention must be "capable of providing at least a three-bit resolution." It should be noted that the three-bit resolution may be provided by a traditional analog-to-digital converter having three output pins, or a delta-sigma analog-to-digital converter having one output pin.

Further, the Applicant controverts the Office's assertion that the comparator of the admitted prior art is a *differential analog-to-digital converter* as claimed in claim 19. The term differential here refers not merely to comparing a single-ended input to a reference voltage, as in the admitted prior art. Rather, the term "differential" here refers to an analog-to-digital converter capable of converting a "differential signal," where that signal is present on both lines of a two-wire differential system. Thus, the admitted prior art fails to teach a differential analog-to-digital converter.

Second, the Office further asserts that it would be obvious to combine the comparator (i.e., analog-to-digital converter) and optical coupler of the admitted prior art with the multiplexer circuit of Scott and the pass-gate architecture of Jamshidi to reach the claimed invention. (3/24/04 OA, pp. 12-15, 17). This argument likewise has previously been addressed. In response to the Office Action of October 24, 2003, Applicant explained that it would not be obvious to one of ordinary skill in the art to combine the comparator of the admitted prior art with the multiplexing circuitry of Scott to reach the present invention, because there is no motivation to do so. Applicant explained that there would be no motivation to make this combination, because the

comparator of the admitted prior art cannot reasonably function as an A/D converter (as used in the present application) with any secondary purpose in Scott et al. or Jamshidi. In response, in the Office Action of March 24, 2004, the Office stated that "[t]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art." (3/24/04 OA, p. 17, citing *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981)).

The Applicant respectfully submits that the Office has misunderstood the nature of the argument presented. The Applicant has not asserted that it would be *impossible* to incorporate the comparator of the admitted prior art with the multiplexed-ADC caller ID feature of Scott et al. Nor has the Applicant argued merely that the prior art references do not explicitly suggest the claimed invention. Rather, the Applicant submits that the Office has failed to present a *prima facie* case of obviousness because the Office has not presented a specific teaching, suggestion or motivation to combine the alleged ADC (comparator and optical coupler) of the admitted prior art with the multiplexed ADC of Scott et al. to reach the claimed invention, which comprises an "analog-to-digital converter . . . capable of providing at least a three-bit resolution."

Neither Scott nor the admitted prior art (notwithstanding the known use of a comparator and optical coupler) individually teach or suggest the use of an ADC for on/off hook detection and, therefore, it is impossible that a combination of these two references could lead one skilled in the art to do so. In fact, as stated above, the

comparator and optical coupler of the admitted prior art do not constitute an "analog-to-digital converter," as that term is used in the art. There is simply no ADC present in the admitted prior art.

Further, the multiplexed ADC in Scott is used solely to communicate either (1) Caller ID information (during ringing conditions while off-hook) or (2) line data signals (during on-hook conditions). In Scott et al., the ADC is **not** used to detect on-hook or off-hook status. Indeed, the MUX in Scott appears to be controlled by, and thus dependent on, the on-hook /off-hook condition: "when caller ID information is present, the caller ID data may be transmitted from lines 1804 and 1806 to an analog-to-digital converter 1814 for conversion of the caller ID data to digital signals. During off-hook operations the MUX 1812 may transmit the off-hook data from the integrated hookswitch circuits 1810 to the analog to digital converter 1814." (Scott et al., col. 27, l. 64—col. 28, l. 3).

It thus appears that the circuit of Scott uses a separate on/off hook detection circuit. Scott does not expressly state the type of on/off-hook detection circuit that might be used, but it may be anticipated that a similar comparator-type circuit would have been employed as that used in the ringing burst circuitry in Scott et al. — i.e., a comparator, set to a certain threshold level, that provides a bistable output across the isolation barrier. (Scott, col. 27, ll. 18-32). It should be noted that this type of circuit is very similar to that already described by the Applicant as admitted prior art, and that in Scott this circuit is separate from the multiplexed ADC. As such, Scott thus provides no suggestion, teaching or motivation to combine the comparator of the admitted prior art with the multiplexed ADC of Scott in the manner suggested by the Office.

Applicant respectfully submits that the Office is improperly applying hindsight: "To reach a proper determination under 35 U.S.C. sec. 103, the examiner must step backwards in time and into the shoes worn by the hypothetical 'person of ordinary skill in the art' when the invention was unknown and just before it was made." (MPEP 2142). There is absolutely no teaching, suggestion, or motivation disclosed by Scott that an ADC may be used (in conjunction with the DSP) to detect the on/off hook status of the telephone. Rather, it appears that the subject matter which only the inventor has described is being used improperly to support the Office's rejections.

Claim 19 is further allowable, because the cited prior art fails to teach or suggest the claim limitation of "a voltage divider for coupling between said tip and ring lines," as discussed above in connection with claim 1.

Claims 20–22, which depend from claim 19, and claim 23 and its dependant claims 24–26, which contain the essence of claim 19 along with certain additional limitations, are allowable for the same reasons discussed above in connection with claim 19

Claims 27–32, 34, and 35 were rejected under 35 U.S.C. §102(b) as being anticipated by the applicant's admitted prior art. The Office asserts, inter alia, that the optical coupler of the admitted prior art satisfies the claim limitation of an "electrical high-voltage interface circuit" in these claims because the optical coupler provides high-voltage isolation between two electrical circuits. (Id., pp. 17-18). Applicant respectfully disagrees. The distinction between the electrical high-voltage interface recited in claim 27 and the optical high-voltage interface of the admitted prior art is clear: an optical high-voltage interface provides isolation by converting the electrical signal to an optical

signal and back again, whereas an electrical high-voltage interface provides isolation by non-optical means (e.g., inductors and/or capacitors). Nonetheless, Applicant has amended claim 27 to explicitly recite that the high-voltage interface is "non-optical." Applicant submits that claim 27 and claims 28–35 that depend from it are suitable for allowance in view of this explicit clarification.

In view of the foregoing amendments and remarks, this application is now in condition for allowance. Applicant respectfully requests the Examiner to issue a Notice of Allowance at the earliest date. The Examiner is invited to contact Applicant's undersigned counsel by telephone call in order to further the prosecution of this case in any way.

Respectfully submitted,

8/24/04
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